$$\int_a^b f(x)\,dx = \lim_{\max \Delta x \to 0} \sum_{k=1}^{n} f(x_k^*)\,\Delta x_k$$

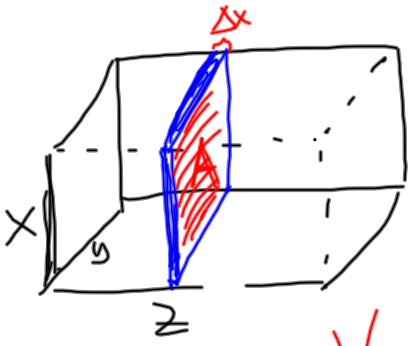
multiply

Usually nonzero quantity in limit

infinitesimally small quantity going to 0

how does this apply to volumes?

consider a box

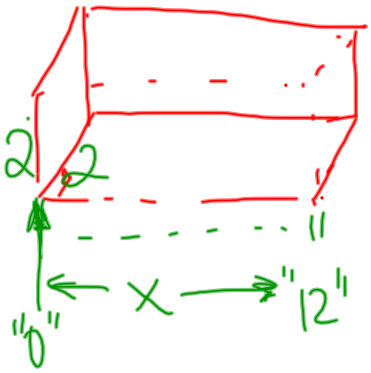


$V = x \cdot y \cdot z$

$= (\text{area of base})(\text{height})$

$V_{\text{cross sectional piece}} = \sum_{k=1}^{n} A_k \cdot \Delta x_k$

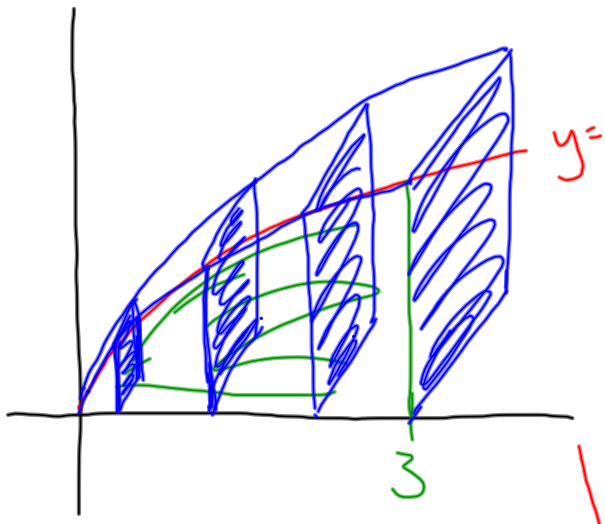
Consider $\lim_{\substack{n\to\infty \\ \max \Delta x \to 0}} \sum_{k=1}^{n} A_k \Delta x_k = \int_{\text{start}}^{\text{end}} A(x)\, dx$



$$\text{Volume} = \int_0^{12} 4\,dx$$

$$= 4x\Big|_0^{12} = 48 - 0 = 48 \text{ cubic inches}$$

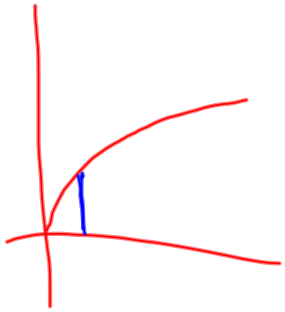
Feb 6-7:53 AM



$A_{square} = (side)^2 = (\sqrt{x})^2$

$= x$

Volume =



$$\int_0^3 A(x)\,dx$$

$$= \int_0^3 x\,dx = \frac{x^2}{2} = \frac{9}{2}\ cu$$ whats